

# The GAPS Experiment: A Search for Dark Matter Using Low Energy Antiprotons and Antideuterons

Completed Technology Project (2017 - 2021)



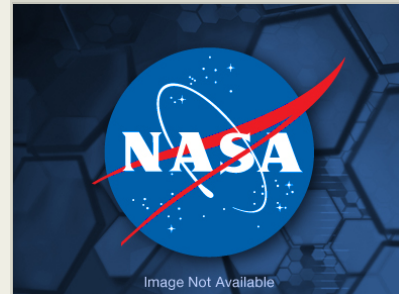
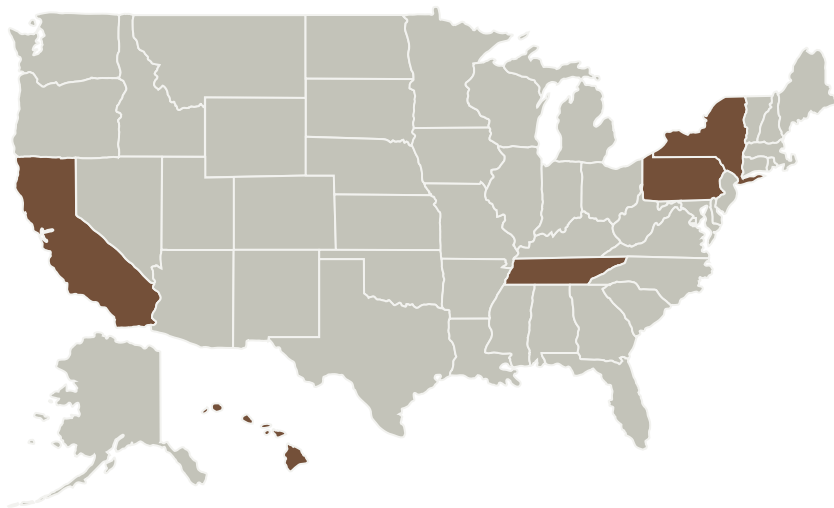
## Project Introduction

This is the lead proposal for a multi-institutional proposal which includes UCLA, UCB, University of Hawaii, and M.I.T. The general antiparticle spectrometer experiment (GAPS) is a balloon-based search for dark matter. It uses a Lithium-drifted Silicon tracking telescope to detect X-rays and particles emitted when antimatter, produced by dark matter annihilation and decay, is stopped in the instrument. A flight from Antarctica can significantly constrain or detect dark matter.

## Anticipated Benefits

The Astrophysics Research and Analysis program (APRA) supports suborbital and suborbital-class investigations, development of detectors and supporting technology, laboratory astrophysics, and limited ground based observing. Basic research proposals in these areas are solicited for investigations that are relevant to NASA's programs in astronomy and astrophysics, including the entire range of photons, gravitational waves, and particle astrophysics. The emphasis of this solicitation is on technologies and investigations that advance NASA astrophysics missions and goals.

## Primary U.S. Work Locations and Key Partners



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| Organizations Performing Work                               | Role                    | Type          | Location                                     |
|---|-------------------------|---------------|--|
| The Trustees of Columbia University in the City of New York | Lead Organization       | Industry      | New York, New York                           |
| Columbia University in the City of New York                 | Supporting Organization | Academia      | New York, New York                           |
| Istituto Nazionale di Fisica Nucleare I.N.F.N.              | Supporting Organization | Academia      | College Park, Maryland                       |
| Japan Aerospace Exploration Agency(JAXA)                    | Supporting Organization | International | Sagamihara, Outside the United States, Japan |
| Massachusetts Institute of Technology(MIT)                  | Supporting Organization | Academia      | Cambridge, Massachusetts                     |
| National Institute for Nuclear Physics(INFN)                | Supporting Organization | Academia      | Outside the United States, Italy             |
| Oak Ridge National Laboratory(ORNL)                         | Supporting Organization | R&D Center    | Oak Ridge, Tennessee                         |
| Pennsylvania State University-Main Campus(Penn State)       | Supporting Organization | Academia      | University Park, Pennsylvania                |
| University of California-Berkeley(Berkeley)                 | Supporting Organization | Academia      | Berkeley, California                         |

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## Organizational Responsibility

### Responsible Mission Directorate:

Science Mission Directorate (SMD)

### Lead Organization:

The Trustees of Columbia University in the City of New York

### Responsible Program:

Astrophysics Research and Analysis

## Project Management

### Program Director:

Michael A Garcia

### Program Manager:

Dominic J Benford

### Principal Investigator:

Charles J Hailey

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| Organizations Performing Work          | Role                    | Type  | Location                                |
|--|-------------------------|---|---|
| University of Hawaii Maui College      | Supporting Organization | Academia<br>Alaska Native and Native Hawaiian Serving Institutions (ANNH), Asian American Native American Pacific Islander (AANAPISI) | Kahului, Hawaii                         |
| University of Latvia                   | Supporting Organization | Academia  | Riga, Outside the United States, Latvia |
| University of Southern California(USC) | Supporting Organization | Academia<br>Asian American Native American Pacific Islander (AANAPISI)  | Los Angeles, California                 |

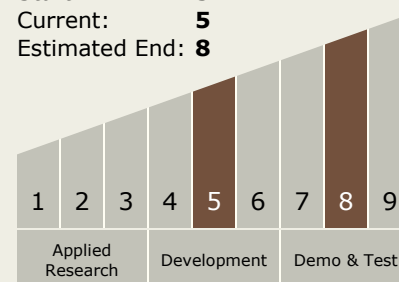
## Project Management (cont.)

### Co-Investigators:

Philip A Von Doetinchem  
Isaac Mognet  
Hideyuki Fuke  
Lorenzo Fabris  
William Craig  
Mirko Boezio  
Kerstin M Perez  
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Steven E Boggs  
Florian H Gahbauer  
Valter Bonvicini  
Rene A Ong  
Jeffrey A Zweerink  
Heather Horgan

## Technology Maturity (TRL)

Start: 5  
Current: 5  
Estimated End: 8



## Technology Areas

### Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
  - TX11.3 Simulation

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### Primary U.S. Work Locations

|            |              |
|------------|--------------|
| California | Hawaii       |
| New York   | Pennsylvania |
| Tennessee  |              |

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## Technology Areas (cont.)

└ TX11.3.5 Exascale  
Simulation

## Target Destination Outside the Solar System